

# Electrical Service



As frustrating as it can be along the way, there's a particular satisfaction that you get when you finally track down a really difficult electrical problem. That feeling of satisfaction comes right back the next time you see another car with the same problem. The first time is the worst time, and knowing where to start your diagnosis is a big help.

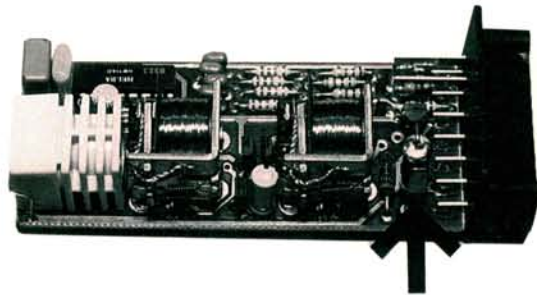
Unfortunately, many electrical problems are of the "one in a million" variety. You can be pretty sure as soon as you fix one of these that you'll never see another like it. Even so, you store the information away in your memory bank, just in case.

But the odds are pretty good that one of your fellow technicians will probably end up struggling with the same or a similar problem some day, even if you never see another one quite like it yourself. Think of the time and frustration you could save that poor guy if you could tell him what you already know. To look at it another way, that poor guy could be you.

That's what **Electrical Service** is all about, sharing information. Each time we run this feature, we beat the bushes for an assortment of helpful electrical tips that are new to us (and hopefully new to you too).

Maybe you're sitting on a few electrical tips of your own that you learned the hard way. If you think the rest of us already know what you know, you're probably wrong. Everyone benefits when we share our knowledge.

A special thanks goes out to the many technicians who generously volunteered their knowledge and experience to make this month's **Electrical Service** possible. Keep those cards and letters coming.



## BMW Central Locking System

A melted fuse connection can wipe out the central locking system on late model BMWs. The small strap-type fuse that's soldered into the edge of the locking system's control unit seldom blows. But the solder attaching the fuse to the board may melt instead, causing an open circuit. Soldering the fuse back onto the circuit board may only be a temporary fix. Always check the master switch in the driver's door. High master switch resistance probably melted the fuse solder connections in the first place.



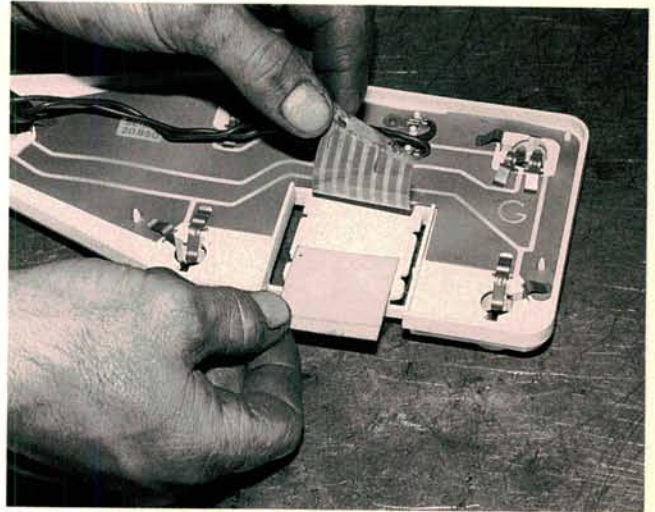
## BMW Headlight Wiring

The combination of sharp sheet metal edges and engine vibration may disable the right side headlights and turn signal bulb on 3 series BMWs. The wiring harness supplying the right side lights runs under or next to the A/C high pressure hose, between the receiver drier and condenser. Tight quarters often put the harness between the hose and jagged sheet metal. Repair, then reroute the damaged wiring. There's no hose on the left side, so the wiring is seldom affected.



### BMW Trunk Lighting

The trunk light feed wiring may be damaged by sharp edges on the left trunk lid hinge of 3 series BMWs. Most of the red/green feed wire is protected by heat shrink tubing. But the two inches or so that's often left exposed can short to ground on the trunk hinge when the car hits bumps, when the trunk is opened or closed, or any other time it decides to. Other electrical components that share this circuit include the interior lights, radio memory, on-board computer module, and multi-function clock.



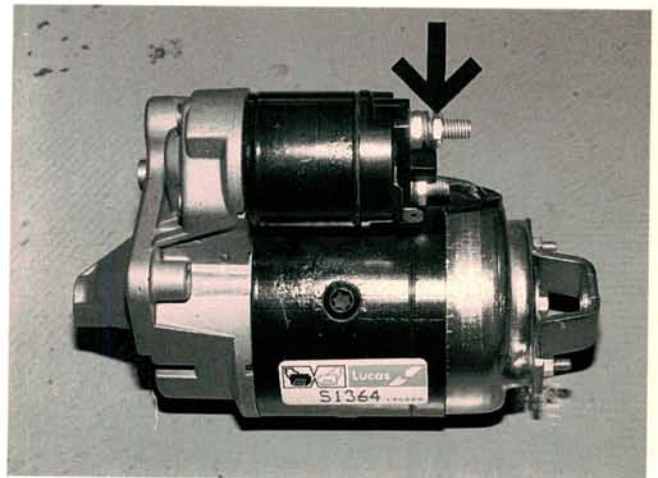
### Renault Tail Light Wiring

Erratic tail light operation on Renault 18i and Fuego models may be caused by poor or damaged connections at the tail light printed circuit, license plate light socket, or fuse block. A plastic shim is available to tighten the connection between the tail lamp printed circuit and wiring connector. Corroded license plate light sockets can also increase circuit resistance, causing damage to the left tail lamp printed circuit. The extra resistance and heat may also damage the tail light section of the fuse block.



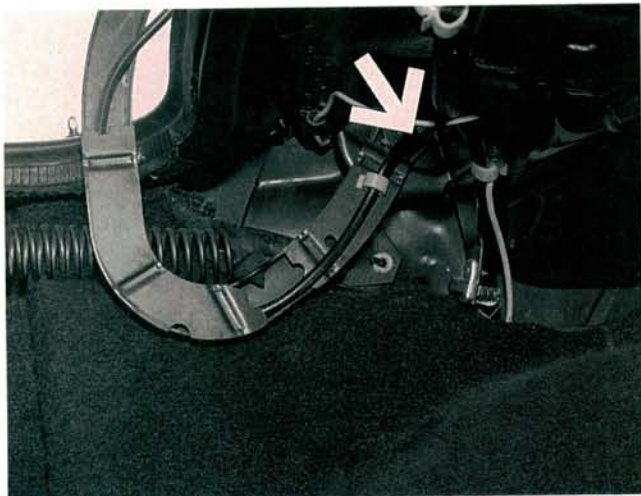
### Renault ECU Damage

The battery on early Renault Alliances and Encores is mounted directly above the ECU wiring harness. Battery acid can collect on the ECU harness, penetrate the harness seals, and then follow the wiring harness to the ECU. Once the acid gets inside, it's good-bye ECU. The overflowing battery may be caused by extra water entering through loose vent caps or overcharging caused by voltage regulator problems. Check for proper alternator charging voltage.



### Renault No Start

A no-crank condition on Renault Alliances and Encores may be misdiagnosed as a faulty starter. The actual cause may be a voltage drop between the battery cable and starter connection. The starter nut may appear tight, but still have poor current flow. Measure the voltage drop between the battery cable and starter terminal with a DVOM. The voltage drop should be less than 0.2 of a volt. Clean the cable and starter terminal, then install a star washer to ensure a good electrical connection.



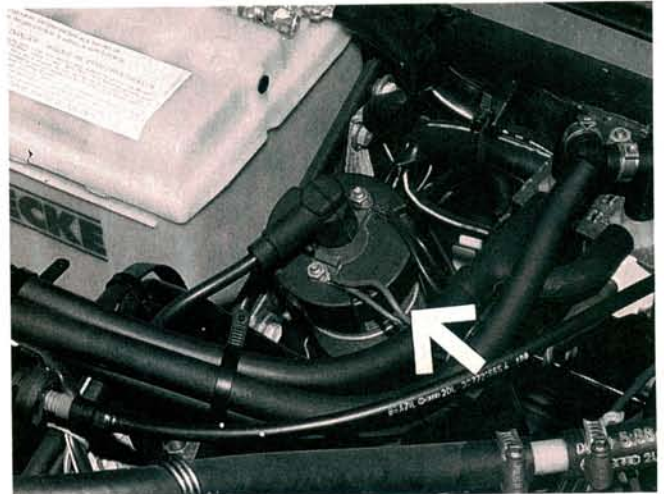
### Audi 5000 Tail Lights

Frayed wiring in the tail light wiring harness may cause erratic tail light operation on 1984 and later Audi 5000s. The harness is attached to the trunk hinge, and bends slightly each time the trunk is opened or closed. The wiring insulation wears through, allowing neighboring wires in the harness to short against one another. Brake lights that light when the parking lights are turned on is one example of the problems frayed wiring can cause. Wires may also short to ground and blow a fuse.



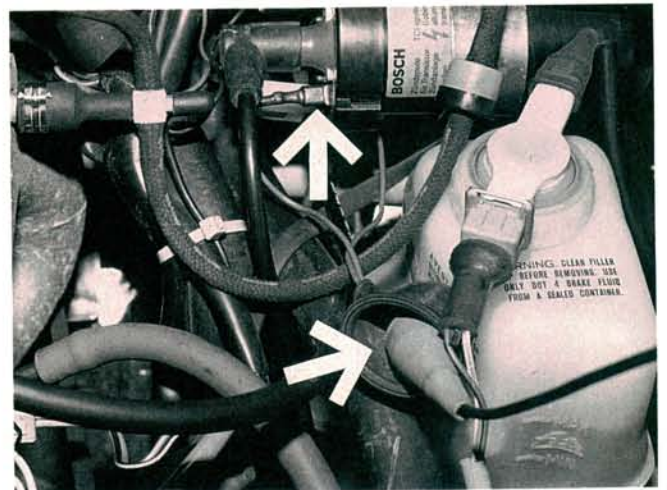
### Lean Running Volkswagen Jetta or Quantum

Stray voltage in the oxygen sensor circuit may cause a lean running condition on CIS-E equipped Jettas and Quantums. Disconnect the oxygen sensor to test the circuit. Install a DVOM between the oxygen sensor's harness side connector and the ground terminal at the cold start valve. With the ignition on, the ECU bias voltage should be 0.55 volts or less. Remove the ECU harness connector if your reading is higher. Clean any grease from the connector with rubbing alcohol. Air dry the connector before reinstalling it, then repeat the test.



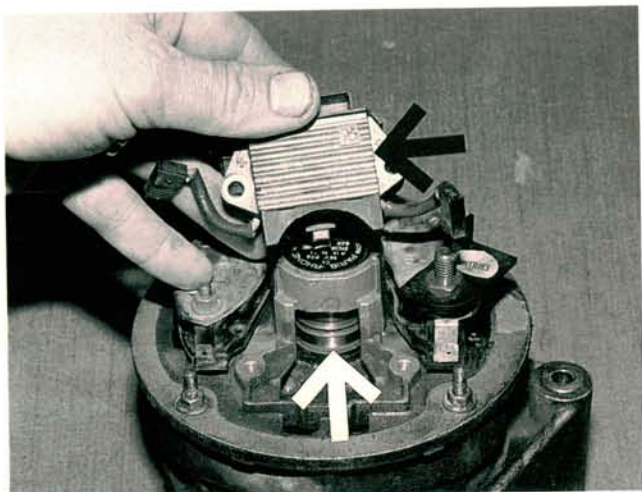
### Volkswagen/Audi Ignition Coils

Coil tower and coil wire burnout problems on 1985-86 Audis and 1985 and later Volkswagens may be caused by ignition coils with black part number labels. Symptoms of this problem are hard starting, poor performance, or a no-start condition. Replace damaged Volkswagen and Audi black label coils with updated green label coils, P/N 211 905 115 D. Make sure the engine also has non-resistor ignition wires and spark plugs installed to prevent future coil tower and coil wire burnout.



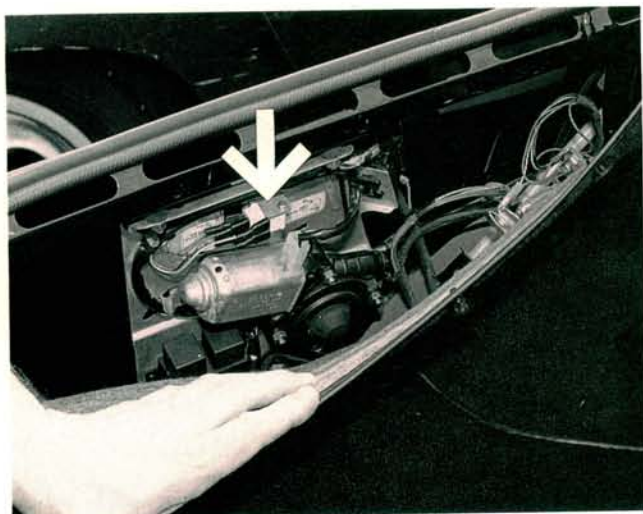
### Golf and Jetta ECU Failure

Use extra caution when working near the ignition coil or attaching test equipment to ignition coil terminal 1 on 1988 and later Volkswagen Golfs and Jettas. Accidentally shorting terminal 1 to ground will permanently damage the Digifant II ECU used on these models. Don't attach test equipment directly to the coil. Attach a jumper wire with a well shielded terminal end to the coil terminal first. Then attach your test equipment to the shielded test lead. Better safe than sorry.



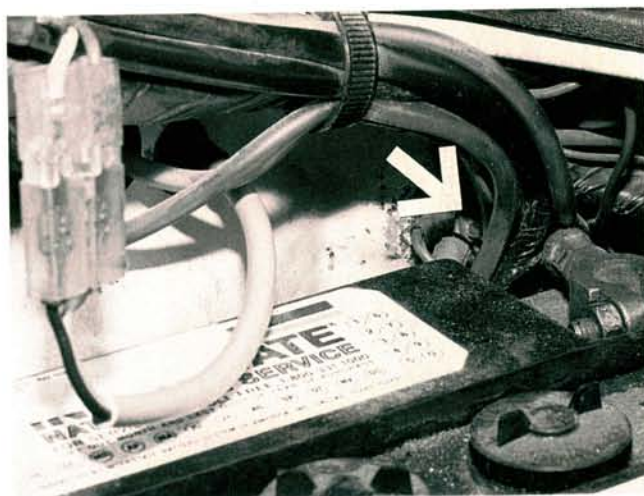
### Porsche 911 Overcharging

A defective voltage regulator may cause overcharging and rapid alternator slip ring and brush wear on Porsche 911s equipped with Paris-Rhone alternators. Resurface or replace deeply grooved slip rings, then install an updated voltage regulator. The updated regulator's large cooling fins also help cool the internal regulator. Overcharging may cause any number of problems. Common symptoms include abnormally high tachometer readings and a dash board with every warning light except the alternator warning light blazing away.



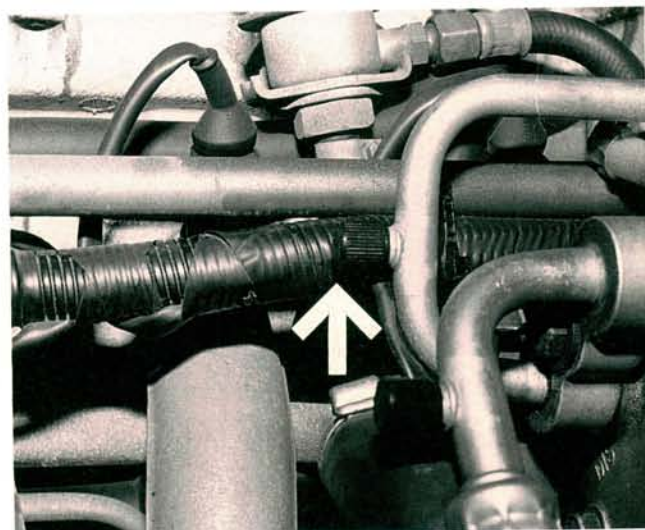
### Porsche 944 Sunroof Operation

Improper sunroof operation may be caused by mis-adjusted limit switches on Porsche 944s. The sunroof uses three microswitches; one at each rear corner of the sunroof panel, and one at the rear of the sunroof track on the left side of the luggage compartment (shown). The microswitches limit the fore/aft and tilt movements of the sunroof. Remove the trim panels to inspect the microswitches' L-shaped metal mounting brackets. Straightening twisted mounting brackets should restore the sunroof to normal operation.



### Porsche 911 Battery Ground Strap

Pay extra attention to the ground wires and battery ground strap during electrical diagnosis, or while changing a Porsche 911 battery. The main grounding point for the strap and other electrical system ground wiring is a brass piece with mounting stud that's attached to the left inner fender area. This poor character always seems to get a coat of paint if the car has had any left front fender bodywork. It can also corrode from battery leakage and fumes.



### Saab 900 A/C Fuse

If you've got a short in the manual air conditioning system on a 1983 or later Saab 900 that's got you at the end of your rope, try testing the surge suppression diode wired between the compressor's power supply lead and ground. The A/C fuse will blow every time the compressor tries to engage if the diode has continuity in both directions. You'll find the diode wrapped in tape inside the wiring harness that runs next to the fuel rail, between the two cylinders nearest the flywheel.



### Ground Control to Major Tom

We wrote about Saab 900 ground connections in the very first issue of *Import Service*, and they're still causing problems. Saab calls the grounding point on the radiator crossmember under the battery "Earthing Point 7." Corrosion and high resistance at this ground connection can cause problems with the headlights, turn signals, fog lights, A/C and radiator cooling fans, and windshield washer motor, to name just a few. Make sure all wires attached to this ground point are clean and tight.



### Grounds for Separation

Many of the ground connections for electrical circuits at the rear of the car on Saab 900s are located under the trunk floor lid in the luggage compartment. Saab calls this "Earthing Point 9." Number 9 isn't exposed to quite as much abuse as its cousin Number 7 at the front of the car. It's more likely to suffer from neglect since it's hidden away in its dark dungeon. If you're having problems with the rear lighting, raise the trunk floor lid, then make sure all wires at Number 9 are clean, unbroken, and tight.



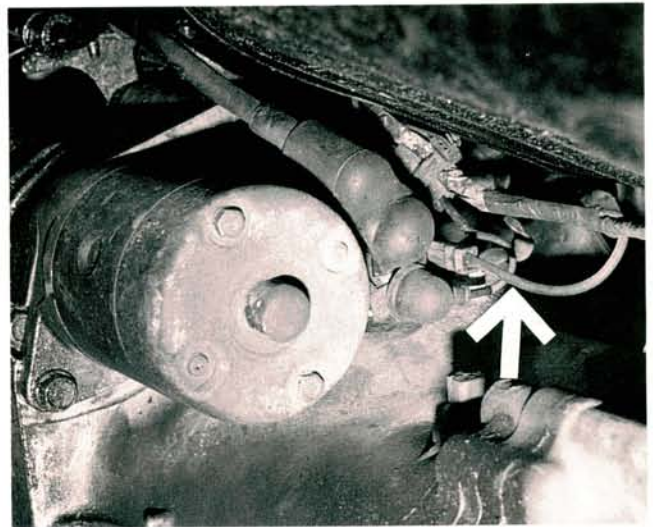
### Phantom Mazda Headlight Warning Buzzer

The headlight warning buzzer on 1981-85 Mazda RX-7s may buzz for no apparent reason. Carefully inspect the warning buzzer relay, mounted in front of the battery on the left side of the core support. If the relay fills with water, it can short the contacts and cause the warning buzzer to go off at random or moan half-heartedly. Replacement warning buzzer relays have better waterproofing which should eliminate the phantom buzzer syndrome.



### Toyota Tercel Cooling Fan

The radiator cooling fan motors used on 1983-88 Toyota Tercels often overheat and fail. Always determine the wattage rating (80 or 120 watts) before replacing the motor. Check the sticker on the motor, or measure the motor case diameter (120 watt motor cases are larger). Always replace the fan relay and fusible link at the same time. Both parts may have also been damaged when the motor failed. Most fan motors use a pink 30 amp fusible link that looks like a large plastic fuse with female terminals.



### Mazda No Start

Starter solenoid wire corrosion may cause a no-crank condition on Mazda RX-7s. The connection between the solenoid wire connector and starter solenoid terminal may appear clean and tight. Corrosion inside the solenoid wire about two inches away from the connector causes a voltage drop that's big enough to keep the starter solenoid from engaging. A voltage drop test between the ignition switch and the solenoid terminal will reveal this wiring corrosion.



### Toyota Headlight Control Relay

The headlight control relay used on 1985 Toyota Celicas and Supras may fall out of its mounting bracket, allowing the relay wiring to short against the inside of the body. This may blow the headlight fuse or cause erratic headlight operation. The relay is mounted inside the left rear quarter panel. A shorted relay may cause the concealed headlights to open by themselves. This can drain the battery if it happens after the car has been parked and left unattended. Also check for frayed or exposed wiring in this area.